



NSBF Overview

**Balloon Working Group Meeting
Goddard Space Flight Center
June 30, 2003**

**Danny RJ Ball
Site Manager
National Scientific Balloon Facility**



Flight Summary

Flt #	P.I.	Date	Site	Science	Balloon	Payload Weight (lbs)	Flight Time (Hrs)	Remarks
504N	Binns	12/20/01	Antarctica	Cosmic	28L	3566	764	Ops/Sci Success
505N	Muller	05/25/02	Sumner	Cosmic	40H	8000	11.5	Balloon Failure
1580PT	Cathey	07/06/02	Palestine	SP Test	21SP	6000	3.7	Balloon Failure
1581P	Anspaugh	07/09/02	Palestine	Solar	3.4	677	6.4	Ops/Sci Success
1582P	Anspaugh	07/25/02	Palestine	Solar	3.4	695	4.9	Ops/Sci Success
506N	Yamamoto	08/08/02	Canada	Cosmic	40H	7000	23.2	Ops/Sci Success
507N	Clem	08/13/02	Canada	Cosmic	40L	3351	38.7	Ops/Sci Success
508N	Evenson	08/26/02	Canada	Cosmic	Big 60	1546	22.4	Ops/Sci Success
509N	Anspaugh	09/07/02	Sumner	Solar	3.4	670	4.7	Ops/Sci Success
510NT	Muller	09/16/02	Sumner	Cosmic	40H	8000	2.7	Science Failure



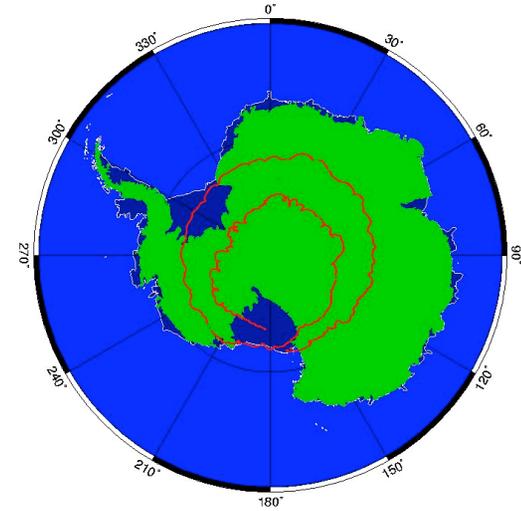
Flight Summary (cont'd)

Flt #	P.I.	Date	Site	Science	Balloon	Payload Weight (lbs)	Flight Time (Hrs)	Remarks
511N	Hanany	09/20/02	Sumner	CMBR	29X	5554	22.6	Ops/Sci Success
512N	Maurer	10/09/02	Sumner	Biophys	1.0	1336	8.7	Ops/Sci Success
513N	Margitan	10/13/02	Sumner	Atmos	4.0	1835	4.5	Ops/Sci Success
514N	Traub	10/20/02	Sumner	Atmos	29X	4092	9.4	Ops/Sci Success
515N	Wefel	12/29/02	Antarctica	Cosmic	29X	4927	477.6	Ops/Sci Success
516N	Ruhl	01/21/03	Antarctica	CMBR	29X	4753	361.7	Ops/Sci Success
517NT	Cathey	03/16/03	Australia	ULDB	21SP	6000	12.2	Balloon Failure
518N	Hanany	05/24/03	Sumner	CMBR	29X	5505	26.6	Ops/Sci Success
1583P	Kogut	06/15/03	Palestine	CMBR	11L	2852	10.7	Ops/Sci Success



TIGER

- 3600 LBS
- 32 Days
- Altitude > 110 KFT
- Continuous TM and Command
- Payload 100% recovered



“Big 60”

- 59.84 mcf balloon conceived and built in 60 days
- .4 mil shell, 2 X .52 mil caps co-extruded Stratofilm 430
- 202 gores
- Gore Length - 750 feet
- Inflated Diameter - 534 ft
- Inflated Height - 429 ft
- Balloon Weight - 2751 lbs
- Seals - 28.7 miles
- Surface Area - 21 acres
- Flight Train Height at Launch - 1000 ft
- Nominal/Max Payload: 1200/1650 lbs
- Nominal Pressure Altitude: 158,400 ft



Flight # 508NT - World Record

- World record for largest balloon ever successfully launched
- Flight 508N/Evenson - launched Aug 26, 2002 from Canada
- Payload - 1546 lbs
- Flight time: 22 hours
- Float Altitude: 160,300 ft (geometric), 0.84 MB



Failures

- **1580PT, 517NT - ULDB Super Pressure balloons failed - Cathey/Gibson to address**
- **510NT/Muller - Science failure**
- **505N/Muller - 40 mcf - 3 cap balloon failure (leaker)**
- **40 MCF Heavy Load History**
 - 23 flights, 18 successful, 5 failures (78% success rate)
 - 11 suspended weight 7500-8000 lbs (LSI = 1553 psi) - 3 failures
 - 8 suspended weight 7000-7500 lbs (LSI = 1511 psi) - 2 failures
 - 4 suspended weight < 7000 lbs - no failures
 - Failures attributed to high gross inflation, launch stress index, folding, spool damage, and dynamic launch



Heavy Load Balloon Redesign

- **Redesign of 40 Heavy Balloon**
 - Reduce LSI to 1400 psi
 - 36.734 mcf vs current 39.57 mcf
 - Float Altitude 119.9 kft vs 122.5
 - Co-extruded 0.8 mil shell with 3 X 0.95 mil caps
 - Longer caps
 - Collar placed 10 feet lower than current practice
- **Spool Padding**
 - 40 Heavy test inflation and inspection showed damage
 - Padding will be added to spool



Remaining FY'03 Flights (and FY'04 Antarctica)

PI	SCIENCE	LAUNCH SITE	DATE
Anspaugh/JPL (2)	Solar Cell	Palestine	July-August
Maurer/JHU	Biophysics	Palestine	July
Atlas/NCAR	Atmos	Palestine	August
Farman/NSBF (2)	SAPR Tests	Palestine	July-August
Rust/JHU	Solar Physics	Palestine	August
Mitchell/Yamamoto/GSFC/KEK	Cosmic	Fort Sumner	September
Devlin/Penn	CMBR	Fort Sumner	September
Boggs/UCB	High Energy	Fort Sumner	September
Harrison/Caltech	High Energy	Fort Sumner	September
Traub/SAO	Atmos	Fort Sumner	October
Toon/JPL	Atmos	Fort Sumner	October
Margitan/JPL	Atmos	Fort Sumner	October
Binns/Gorham WashU/U.Haw	Cosmic	Antarctica	December
Muller/U. Chi	Cosmic	Antarctica	December



New Payloads

- Dr. Eun-Suk Seo - U. Maryland, Cosmic Ray, CREAM - **ULDB**
- Dr. Atlas - NOAA/NCAR, Atmospheric Science, Air Sampler, CWAS - **Conventional**
- Dr. Boggs - UC Berkeley, Nuclear Compton Telescope, High Energy, NCT - **LDB**
- SUNRISE Collaboration - NOAA, Max Planck, Spanish Space Agency, Solar - **LDB**
- Dr. Bianchini - ASI, Mars Lander Terminal Descent System Test - **Conventional**
- Dr. Rust - Johns Hopkins, Solar Physics, Solar Bolometric Imager, SBI - **LDB**
- Drs. Mitchell/Yamamoto - GSFC/KEK, Cosmic Ray, BESS Polar - **LDB**
- Dr. Devlin - Pennsylvania University, Microwave Background, BLAST - **LDB**
- Dr. Harrison - Caltech, High Energy Astrophysics, HEFT - **LDB**
- Dr. Christl, MSFC, Biophysics, Deep Space Test Bed, DSTB - **LDB**
- Dr. Kogut - GSFC, Microwave Background, ARCADE - **LDB**
- JPL - Mars Lander parachute tests - **Conventional**
- USAF - Nanosat Outreach Project - **Conventional**
- Dr. Ryan- U.New Hampshire, Megaball, Gamma Ray- **Conventional**
- Dr. Mlynczak- Langley, Atmospheric, FIRST- **Conventional**



“The Boss” - Antarctic Launch Vehicle

- **Gross Vehicle Weight: 105,000 lbs**
- **Wheel Base Width: 12 ft, 5 in**
- **Total Vehicle Length: 50 ft, 4 in**
- **Engine: 460 horsepower
Caterpillar diesel, 6 wheel drive,
speed faster than advisable.**
- **Capability: 8000 lb payload, 15,000
lb gross inflation**
- **Pin Height: 36 feet**



Engineering Development

- LDB TDRSS high gain antenna successfully tested - 50-150 Kbps
- LDB Iridium data modem successfully implemented- replaces INMARSAT and HF/ARGOS
- LDB LOS and OTH video compression capability for downlinking video
- New LDB PV cells selected- more durable at one half the cost
- New LDB charge controller implemented- more efficient, lower cost
- New LDB Pathfinder payload



Semi-Automatic Parachute Release (SAPR)

- Phase 2A testing completed – SAPR flown active with off line chute release squib.
- 12 successful flights during past year including 1 LDB flight in Antarctica. “Green Light” operational for night terminations.
- Report submitted to NASA/WFF
- Two live pure test flights planned this summer
- Goal is to implement SAPR for this year’s Antarctic campaign

The screenshot displays a flight data interface with the following sections:

- Position:** Latitude 034 deg 29.39' N, Longitude 104 deg 13.31' W
- Speed:** 0.0 kn, Heading 0 deg, Descent Rate -2.0 ft/min
- Altitude:** MKS 880.63 mbar, 3.9 kft, GPS 4.1 kft
- Ascent Rate:** MKS -19 ft/min, GPS -3 ft/min
- Ballast Remaining:** 909.2
- Last Drop (sec):** 2
- Location:** Fort Sumner, Az/EI 151.6/165.2, Distance 0.0 nm
- UTP Housekeeping:** He Valve Open 01:19, Aneroid Safe, Term Verify Fixed, Terminate Armed, Burst Detect Safe, Expl Bolt Safe, Chute Motor Off, Frame Count 36, Chute Out Safe
- UTP Command Echo:**

13:45:39	09/004F
13:50:32	00/0000
13:50:32	09/004F
13:50:54	00/0000
13:50:54	09/004F
13:53:14	09/0000
13:53:14	09/004F
- UTP Command Echo (continued):**

15:08:28	UTP B/U	Expl Bolt Disarm	15
15:08:36	UTP B/U	Chute Motor ON	17
15:08:43	UTP B/U	Chute Motor OFF	21
15:08:52	UTP B/U	He Valve OPEN	E
15:08:59	UTP B/U	He Valve Close	F
18:22:27	UTP PRI	TM XMTR ON	C
18:22:27	UTP B/U		0
- Temperature and Battery:** Air Temp NaN, OAD Temp NaN, Day Temp 38.4, Night Temp 36.0, MKS Temp 34.7, Battery Volts 28.89
- Other Data:** Transponder OFF, Transmitter 2, RCS Range Low, Mode NAV, GPS 1 09/05/01 18:23:43



Fort Sumner Facility Improvements

- 2 acres of asphalt added to launch area
- 300 degree launch finger
- Refurbishing Swedish crane for second launch vehicle
- Welding shop added
- Overhead hoist in old hangar
- Additional lighting



Upgraded Aircraft Support

- Two turboprops
- Two pilot crews
- All pilot labor subcontracted
- Universal telemetry seatpack
- Senior aircraft observer
- Electronics technician



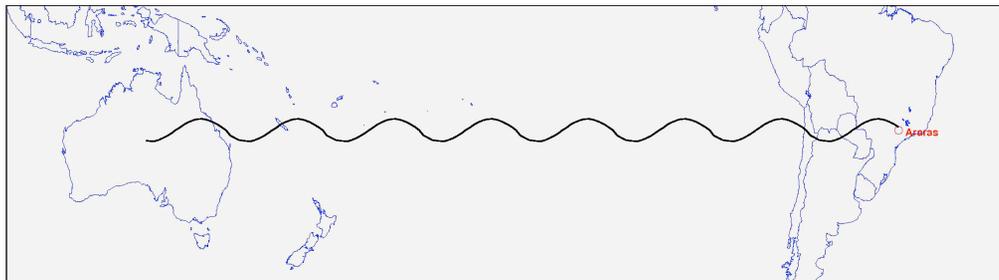
New LDB Brazilian Launch Site

- Two potential sites identified
 - Araras - 22.3S, 47.3W
 - Bocubatu - 22.9S, 48.5W
- Both have launch area, hangars, and infrastructure to support LDB campaigns.
- Automatic weather stations being placed at both sites to assess which is best from a launch standpoint.
- Brazil to Australia mid-latitude LDB flights of 7-8 days

Araras



Bocubatu



Safety, Reliability, and Quality Assurance

- **S, R, & QA Manager hired June 2**
- **Norm Ennis**
 - BS Aeronautical Engineering - Auburn, AA Electronic Technology, MBA nearly complete
 - 20 years experience as Quality Engineer and Manager
 - Member ASQE
- **Reports directly to Site Manager**
 - Responsible for creating and implementing a non-ISO quality system at NSBF covering all areas of activity including electronic, mechanical, balloons, operations, administration, and information technology.
 - Norm's job will be to implement a credible, functional system without fundamental changes to the way NSBF does its job.



Suborbital Center of Excellence

- Funded through a grant from the Balloon Program Office
- Located at PSL/NMSU in Las Cruces
- COE charter is to promote education, research, outreach, and foster interest in Suborbital Programs in the secondary, undergraduate, and graduate educational communities.
- Formally dedicated in January 2002
- 12 Co-ops so far at Las Cruces, Wallops, and Palestine
- 2 open house days at Las Cruces for undergraduate and secondary students



Outreach

- ACES-Space Grant Workforce Development
- Marble Gauges
- American Horticultural Society
- Seattle High School Cosmic Ray Detector



New Balloon Contract

- PSL awarded contract effective April 1
- Four-year base contract
- Two three-year options
- Teaming with Raven, SWRI
- 35% of NSBF employees will qualify for PSL retirement benefits within 4 years (65% within the next 10 years).



NSBF Infrastructure Improvements



Shuttle Columbia Tragedy

- NSBF was Debris Collection Center.
- EPA, FEMA, National Forest Service, Coast Guard, FBI, American Red Cross, and seven government contractors operated out of NSBF between Feb and April.
- Up to 350 personnel located at NSBF. An additional 700 people in Palestine.
- NSBF supplied offices, power, Internet, supplies, security, garbage collection, and unlimited patience.



Tight Security!



No Respect!

